

GRAND RIVER AVENUE BRIDGE
(U.S. Route 16 Bridge)
Spanning the Chesapeake and Ohio
Railroad at Grand Avenue
Novi
Oakland County
Michigan

HAER No. MI-48

HAER
MICH
63-NOV,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD

National Park Service
Northeast Region
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

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HISTORIC AMERICAN ENGINEERING RECORD

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Location: Spanning the Chesapeake and Ohio
Railroad at Grand Avenue, City of Novi,
Oakland County, Michigan

USGS Northville Quadrangle
UTM: 17.4706100.296000

Dates of
Construction: 1925, 1929

Engineer,
Builder Michigan State Highway Department:
Michigan State Construction Division

Present Owner: Oakland County Road Commission
31001 Lahser Road
Birmingham, Michigan 48010

Present Use: Vehicular and Pedestrian Traffic

Significance: This is the sixth longest concrete
"camelback" girder bridge left in
Michigan. It created a grade separation
for Grand River Avenue, which at the time of
construction was part of US Route 16 linking
Detroit with Grand Haven, Michigan, on Lake
Michigan.

Project
Information: This documentation was undertaken in June,
1991 in accordance with a Memorandum of
Agreement by the Oakland County Road
Commission, the Michigan State Historic
Preservation Officer, and the Advisory
Council on Historic Preservation as a
mitigative measure prior to the demolition of
the bridge.

Dr. Charles K. Hyde, Department of
History, Wayne State University, Detroit,
Michigan 48202

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Grand River Avenue approximates the route followed by one of the state's oldest roads. Michigan's Territorial Council authorized construction of a road from Detroit westward to Lake Michigan, to be called the Grand River Road because it met the Grand River near Lansing and then followed it to Lake Michigan. It was known as the Grand River Military Road as well. Although the Michigan Territory surveyed the route all the way to Grand Rapids in 1832, the only segment completed by Michigan's entry into the Union in 1837 was the part from Detroit to Brighton, including the section extending through Novi. The Grand River Road later reached Grand Haven on Lake Michigan in the late 1840s and remained an important east-west highway throughout the nineteenth century.

The Grand River Road is an excellent example of the evolution of land transportation in Michigan and the midwest. Originally an Indian trail, the first segments built in the 1830s were of dirt construction. A significant upgrading, the plank road, became popular in lumber-rich Michigan before the Civil War. A private corporation planked the Grand River Road from Detroit through Farmington in 1836 and all the way to Lansing by 1851, operating it as a toll road. It prospered as long as there was a regular stagecoach service between Detroit and Lansing, and short-haul freight traffic. Following the Civil War, it fell into disuse, unable to compete with the railroads, and was neglected until the early twentieth century, when automobiles began to use it extensively.

Starting on Grand River Avenue in downtown Detroit, a motorist could travel along this highway, designated as US-16 early in the twentieth century, from Detroit to Grand Haven. In 1956-1957, the Michigan State Highway Department relocated and rebuilt US-16 between Farmington and Brighton, including the section through Novi, as the Farmington-Brighton Expressway, a four-lane, limited access divided highway. This new highway then joined the Interstate Highway System as I-96 around 1960, leaving the old Grand River Avenue as a lightly-travelled country road through most of its length. In the 1970s and 1980s, however, as former farm communities in western Oakland county such as Novi became thriving bedroom communities, Grand River Avenue again became a busy thoroughfare.

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Before the construction of this grade separation, the Grand River Avenue crossing of the two Pere Marquette Railway tracks was an unmarked, completely unprotected crossing. Photographs taken on 13 December 1922 show a combination passenger/freight station and a "milk station" just south of the crossing, along with a nearby gasoline service station and several residences.⁴ Local farmers left their raw milk in a frame building west of the tracks for transport to dairies in Detroit. Railroad passenger service into Detroit was also extensive, requiring stairways on all four corners of the structure to allow passengers to descend from the street level above to the railroad grade level below.

The Michigan State Highway Department built this bridge as part of an effort in the mid-1920s to eliminate dangerous grade crossings on major state trunkline highways. Before June 1924, the Highway Department placed under contract a total of nine grade separations, but in the biennium ending in June 1926, the Department contracted for thirteen additional grade separations, including three on Trunkline 16 (later, US-16). Most of the bridges built for this purpose were reinforced concrete "camelback" girder bridges constructed from standard Highway Department plans. The Grand River Avenue bridge was a "twin" to at least three other structures built in 1925-1926, except for its unique abutments.⁵

The State Construction Division built the Grand River Avenue bridge and other concrete bridges and concrete highways under the State Force Account program, which involved the use of state prison labor along with "free" skilled labor. About seven hundred inmates worked on state bridge and highway projects during the height of the construction seasons of 1925-1926. The State of Michigan did not use prison labor for asphalt construction projects, seen as requiring more "specialized," i.e., skilled, labor.⁶ The use of prison labor on highway and bridge projects stopped in 1930, largely because of the availability of large numbers of unemployed workers willing to take these jobs. The State Highway Department estimated the total cost of the Grand River Avenue bridge, excluding right-of-way expenses, at \$122,223.08. The Federal Government paid 47% of the total cost, while "other participants," i.e., Oakland County and the Pere Marquette Railway Company, paid the rest.⁸

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Construction started in October, 1924 and the bridge opened to traffic fourteen months later.⁹ Surviving construction photographs show concrete poured between May and early November, 1925, so that the work carried out over the first eight months focussed on building the massive earth approaches and preparing the reinforcing rods and formwork for the concrete structural members. The photographs taken by the State Highway Department serve as the primary documentation of the construction chronology. The only local newspaper that covered Novi on any regular basis, the Northville Record, largely ignored the project until it was completed. That paper then noted that the bridge required twenty-seven railroad carloads of cement and that two men died during construction. H.J. Horan was the resident engineer and R.D. Clark served as inspector, both from the State Highway Department, while Sherman Williams was the construction superintendent.¹⁰

The earliest photographs documenting the bridge construction were dated 19 May 1925 and show the wooden formwork built for the piers and abutments. The contractor finished the piers by the end of June, the abutments by the end of July, the main girders around 29 August 1925, and the floor beams in late September. They completed the bridge deck by early November.¹¹

This structure has had few alterations since built in 1925. The original bridge design provided for a 30 foot clear roadway with a pair of 6 foot sidewalks, each raised 8 inches above the road surface. At some later point, before October, 1932, the State Highway Department removed the sidewalks to create a clear roadway of 42 feet.¹² This may have taken place in 1929, when the Highway Department lengthened and altered the retaining walls extending from the abutments, along with the railings. They extended the retaining walls at the northwest, southwest, and northeast abutment corners by 23 feet, with the new walls varying slightly in height from 10 feet 6 inches to 11 feet 6 inches. The Highway Department extended the southeast retaining wall by 106 feet. It stood 10 feet 6 inches high.¹³

By April 1939, serious breakage of concrete at the tops of the abutment piers where the main girders rested was evident, requiring substantial repairs.¹⁴ Later deterioration of the concrete staircases led Oakland County to block off the stair entrances with permanent concrete barriers sometime in the 1960s.

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The Grand River Avenue Bridge is a three span reinforced concrete "camelback" girder structure resting on four piers, with the two piers in the middle free-standing and the two outer piers incorporated into the east and west abutments respectively. The bridge proper measures 146 feet 9 inches long and 48 feet wide overall. Because the Highway Department built this grade separation on what was flat land, the bridge required lengthy earth approaches and earth-filled reinforced concrete abutments. The east abutment is 82 feet 6.75 inches long, while the west abutment measures 67 feet 6 inches in length. The railroad line runs Southeast to Northwest, while Grand River Avenue runs East, Southeast to West, Northwest, resulting in a skewed bridge alignment. The bridge intersects the railroad lines at an angle of 34 degrees, as opposed to 90 degrees if the two were perpendicular.¹⁵

None of the piers or abutments required pilings because they rest directly on bedrock. The two center piers, which are identical, are 93 feet, 8.75 inches in length overall, measured from the outside edges of the footing foundations. The piers are considerably longer than the width of the bridge because of their skewed alignment. Each pier consists of two basket arch segments that rest on a total of three footings, all of reinforced concrete construction. All the footing foundations are 2 feet 6 inches high and 10 feet wide, while the two outside foundations are 12 feet 8 inches long and the center one is 13 feet 9 inches long. The center footings for both piers are rectangular, measuring 5 feet 2 inches wide, 8 feet 2 inches long and 6 feet 6 inches high and are surmounted by rectangular caps 5 feet 8 inches wide, 8 feet 7 inches long, and 1 foot 6 inches high. The outside footings are oval-shaped, 8 feet 1 inch long and 5 feet 8.50 inches wide, surmounted by caps 4 inches larger in diameter. The pier structure is 4 feet 2 inches wide where it rests on the center footings and five feet in diameter where it rests on the outside footings, but then tapers to 3 feet wide at its top, where it supports the main bridge girders and deck. The pier structure above the footing caps is 14 feet 8.5 inches high overall. The two abutment piers, also identical to each other, have the same general design as the center piers, but slightly larger footings and total size. The piers support the concrete girders and floor beams and provide clearance of 22 feet 6 inches between the top of the railroad tracks and the bottom of the bridge.

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The major structural support system comprising the bridge deck consists of three pair of reinforced concrete "camelback" girders, one pair for each span, with the girders placed on the outside edge of the bridge. The rest of the structural system consists of pier and abutment bearing walls and floor beams that extend either parallel or perpendicular to the pier alignment. The bridge deck then rests on the floor beams.

The "camelback" girders are similar in most dimensions except length, with the eastern span 40 feet 5.75 inches long, the middle span 65 feet 11 inches long, and the western span 40 feet 4.25 inches long. The girders are cambered, with the top of the center span 2 feet 5 inches higher in the middle than at the ends, while the tops of the two end spans are only 9 inches higher in the middle. The center girder is 1 foot 9 inches thick at the top, for 2 feet only, but then is recessed to 1 foot 3 inches thick for 3 feet 9 inches before widening at the base to a thickness of 2 feet 7 inches, which it maintains over its entire length down to the connections with the piers. The two end spans have slightly smaller dimensions. The end portions of the center girders extend below the middle horizontal segment to form the structural connection with the piers, so that the girder has the same height of 9 feet 11 inches at the piers as in the middle of the girder. The center girder also has pilasters over the piers, each pilaster 2 feet 6 inches wide at the base, narrowing to 1 foot 8 inches wide at the top, 9.50 inches thick, and 9 feet 11 inches high.

The rest of the structural system supporting the bridge deck consists of a pair of abutment bearing walls, each 2 feet six inches wide and 5 feet 8.50 inches deep and two pier bearing walls, each 1 foot 6 inches wide and 5 feet 8.50 inches deep, all 93 feet 8.75 inches long, resting directly on the piers and abutments; eight floor beams which run parallel to the piers and measure 1 foot or 1 foot 3 inches wide and 3 feet 1 inch deep, irregularly spaced and supported by the girders; and twenty-one floor beams running perpendicular to the piers, all measuring 1 foot 9 inches wide and 3 feet 2.50 inches deep and placed 9 feet apart, center-to-center, also supported by the girders. The bridge deck is a monolithic concrete slab 8 inches thick which rested on the bearing walls and floor beams described above. The road surface or pavement, poured on top of the deck, is 7 inches thick at the center of the bridge and 3 inches thick at the curbs.

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The skewed alignment of this bridge along with the need to build large-scale earth embankments as approaches resulted in massive, skewed abutments. Because of heavy use of the railroad passenger station at railroad grade level and the extensive pedestrian traffic at this intersection, all four abutment or approach facades running parallel to the roadway have stairways leading from the railroad grade level to the roadway grade level above.

The two abutments are triangular, with the abutment piers forming one side, a pair of outer abutment walls with staircases forming the second side, and a wall perpendicular to the roadway and supported by the earth embankment, making up the third side.

The two abutments are mirror-images of each other. The north wall of the east abutment and the south wall of the west abutment are 67 feet 6 inches long, 8 feet 3 inches thick, and 31 feet 9.50 inches high, excluding footings. They begin with and connect to the northeast and southwest abutment piers respectively and run parallel to the roadway and the bridge. Each wall has 5 reinforced concrete buttresses that help support it. The buttresses are truncated triangles, 25 feet 7 inches high, 8 feet 3 inches wide at the base and 1 foot 3 inches wide at the top. Four of the five are 1 foot 6 inches thick, while the remaining one is 3 feet thick. The third side of each abutment is a reinforced concrete wall, 10 feet 6 inches wide, 53 feet 6 inches long, and 26 feet 6 inches high, which runs perpendicular to the roadway. Each connects at its end with the southeast and northwest abutment piers respectively, and is supported by three concrete buttresses, all 1 foot 6 inches thick, with the same overall dimensions as the others. The result is a bridge with two large open abutment spaces flanked by thick walls and protruding buttresses.

Three of the four abutment wing walls extending from the bridge are virtually identical, while the fourth, at the southeast corner, is distinct. The three similar ones measure 67 feet 6 inches long, 31 feet 9.50 inches high, and 8 feet 3 inches thick.

The southeast abutment wall originally had the same overall dimensions as the others, but grew in length some 142 feet 1.50 inches in 1929 when the retaining walls were altered. It now extends for a total of 209 feet 7.50 inches. The Highway Department also modified the design of the balustraded railings in 1929, when rectangular fluted spindles replaced the original rounded ones.

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Each abutment wing wall is surmounted by concrete railings divided into panels by pilasters that correspond to the supporting buttresses, with the end panels solid and the rest balustraded. The panels vary in length from 8 feet 2 inches to 10 feet center-to-center. The end pilasters are 3 feet 5 inches high, including a base 10 inches high, 1 foot 6 inches wide and 1 foot 4 inches deep and a cap of the same dimensions. The center of the end pilasters is 1 foot 9 inches high, 14 inches wide, and 1 foot thick, with a 1 inch rectangular bevelled recessed panel. The intermediate pilasters are 3 feet 3.75 inches high, 1 foot 4 inches square at the base and cap, 1 foot wide, and 7 inches thick. The upper and lower rails on the balustraded segments are 8 inches high and 6.50 inches thick. The spindles are 1 foot 9.25 inches high, with a cap 7.50 inches by 6.50 inches by 2 inches high and a base 8 inches by 7 inches by 2.75 inches high. The main spindle shaft is 6 inches wide and 5 inches thick, with vertical fluting on the facades. The solid railing sections have rectangular 1 inch bevelled recessed panels 1 foot 4 inches high and varying in length from 5 feet 4 inches to 7 feet 4.50 inches.

A plaque at the northeast corner of the bridge reads as follows:

Federal Aid Grade Separation
Built Jointly By the Federal Government
State Highway Department
Pere Marquette Railway Company
Board of Oakland County Road Commissioners
Under the Supervision of Frank F. Rogers
State Highway Commissioner

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The arrangement of staircases is identical for the southwest and northeast abutment wings, while the northwest abutment staircase differs only slightly from these. At the first two abutment wings, pedestrians enter a rectangular landing 8 feet 2 inches long and 5 feet 11.50 inches wide at highway grade level and make a quarter-turn to proceed down the stairs. The northwest abutment stairs differ only in that the landing at the roadway grade level is a right triangle, with the hypotenuse parallel to the railroad tracks. The staircases at the three abutments are 5 feet 11.50 inches wide, extend parallel to the abutment wing wall from the bridge for a total of 49 feet 8.75 inches measured horizontally to a second corner landing, 16 feet below, measured vertically. The long staircase has two steps, each with 7 inch risers and 11 inch treads, then a landing 3 feet 6 inches long, followed by another pair of steps and a landing, etc. At the second corner landing, 6 feet 5 inches wide and 7 feet 5 inches long, following a quarter-turn there is a shorter set of stairs 7 feet 5 inches wide, with 7 inch risers and 11 inch treads, descending the final 13 feet to the railway grade level.

Staircase railings are solid reinforced concrete 3 feet 3 inches high, 12 inches thick at the base and cap, but narrowing to 8 inches in the middle segments, and include rectangular 1 inch bevelled recessed panels 1 foot 4 inches high that reduce the thickness of the railing to 6 inches. A series of concrete buttresses labelled "counterforts" that serve as piers support all the staircases from below. They are 1 foot 6 inches thick, 16 feet 6 inches wide at the base, but narrow to 10 feet six inches wide at the point where the staircase rests and then taper to only 2 feet 5 inches at the top. They vary in height depending on the height of the staircase they support.

The southeast abutment varies in general layout and in some minor details from the other three. The main staircase from the road grade level is the same as at the other abutments, but is only 5 feet 7 inches wide, and leads to a segmented elevated landing 6 feet 3 inches wide, with one segment 23 feet long and skewed to run parallel to the rail line, while the second segment, 21 feet 4.50 inches long, is parallel to the road and continues as a 6 foot sidewalk. The staircase from the landing to railroad grade level is 8 feet 6 inches wide, 14 feet 10.50 inches long, measured horizontally, and 7 feet high. The dimensions of the treads, risers, and railings are the same as found at the other abutments.

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NOTES

¹ Dunbar and May, Michigan, A History of the Wolverine State, p. 191.

² Rowena Salow, "The Story of Novi's Development," pp. 16-17.

³ State of Michigan, Twenty Sixth Biennial Report of the State Highway Commissioner (Lansing, 1956), pp. 46, 50.

⁴ Total of eight negatives dated 13 December 1922 in the Michigan State Highway Department Collection, State of Michigan Archives, Record Group 59-17, Oakland County.

⁵ State of Michigan, Eleventh Biennial Report of the State Highway Commissioner For the Fiscal Years Ending June 30, 1925 and June 30, 1926 (Lansing, 1926), pp. 33, 38, 41, and 46.

⁶ Ibid., pp. 45-51.

⁷ State of Michigan, Thirteenth Biennial Report of the State Highway Commissioner, For the Years Ending June 30, 1929 and June 30, 1930 (Lansing, 1931), p. 41.

⁸ State of Michigan, Eleventh Annual Report of the State Highway Commissioner, pp. 160-161. A bronze plaque on the northeast corner railing of the bridge lists the Pere Marquette Railway Company and the Oakland County Road Commission as participants.

⁹ "Novi Viaduct Soon To Be Opened For Travel," Northville Record, 11 December 1925, p. 8.

¹⁰ Ibid.

¹¹ Michigan State Highway Department Collection, State of Michigan Archives, Record Group 59-17, Oakland County, photographs dated 19 May 1925 (13 views); 29 June 1925 (6 views); 18 July 1925 (1 view); 23 July 1925 (1 view); 29 August 1925 (2 views); 24 September 1925 (2 views); and 4 November 1925 (2 views), all taken by H.J. Horan, Resident Engineer.

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¹²Ibid., negatives dated 24 October 1932 (5 views).

¹³Engineering drawings first drawn in September, 1926, but not approved until October 1929.

¹⁴Michigan State Highway Department Collection, State of Michigan Archives, Record Group 59-17, Oakland County, negatives dated 26 April 1939 (4 views).

¹⁵The description of the Grand River Avenue Bridge, including all dimensions, is based primarily on the Michigan State Highway Department engineering drawings prepared in 1925 and now in the hands of the Oakland County Road Commission. Some dimensions were field-checked for accuracy.

II. SOURCES OF INFORMATION

- A. Architectural Drawings: Engineering Drawings, X1 of 63-13-2, prepared by the Michigan State Highway Department, but now owned by the Oakland County Road Commission, 31001 Lahser Road, Birmingham, Michigan 48010. This includes 37 sheets drawn in 1925 and 7 additional sheets covering changes made to retaining walls and railings, dated 8 October 1929.
- B. Historic Views: A collection of about 60 negatives taken by several State Highway Department staff members. Included are 8 views of the crossing and environs in December 1922 and 10 views taken in 1929-1938 of repairs to the bridge. H. J. Horan, the State Highway Department Resident Engineer on the project took the bulk of the construction views shot in 1925. These are found in the Michigan State Highway Department Collection, Record Group 59-17, State of Michigan Archives, 717 West Allegan Street, Lansing, Michigan 48918.

D. Bibliography

1. Primary and unpublished sources:

The Northville Record, 1924-1925.

2. Secondary and published sources:

Willis F. Dunbar and George S. May, Michigan. A History of the Wolverine State (Grand Rapids, 1980).

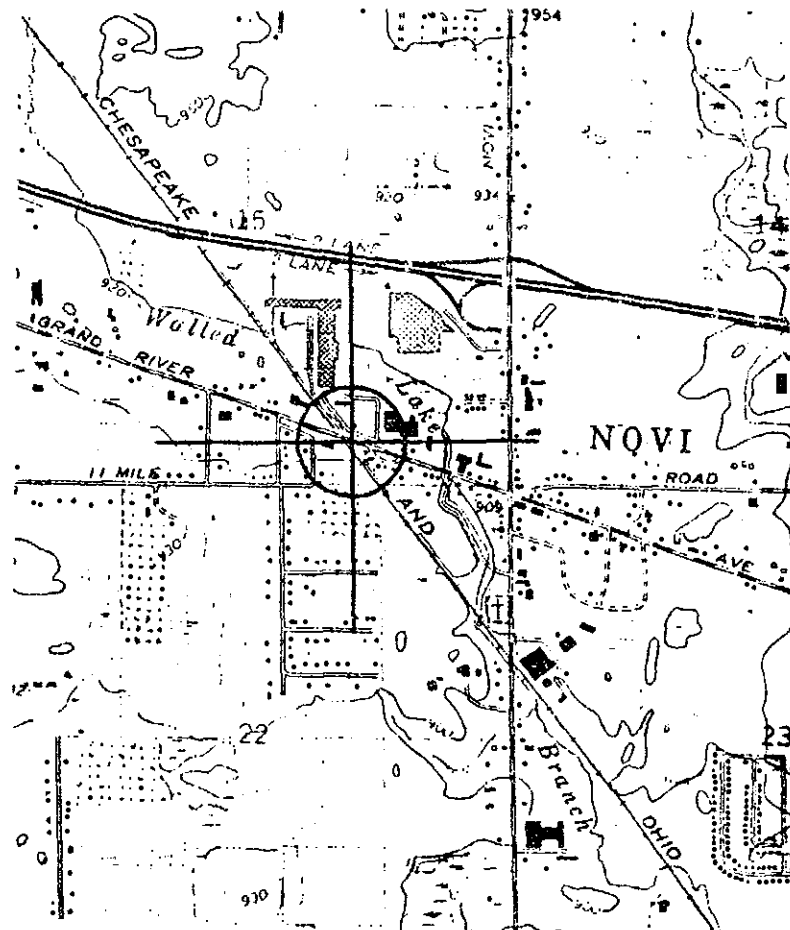
State of Michigan, Eleventh Biennial Report of the State Highway Commissioner For the Fiscal Years Ending June 30, 1925 and June 30, 1926 (Lansing, 1926).

State of Michigan, Thirteenth Biennial Report of the State Highway Commissioner For the Fiscal Years Ending June 30, 1929 and June 10, 1930 (Lansing, 1931).

State of Michigan, Twenty Sixth Biennial Report of the State Highway Commissioner For the Fiscal Years Ending June 30, 1955 and June 30, 1956 (Lansing, 1956).

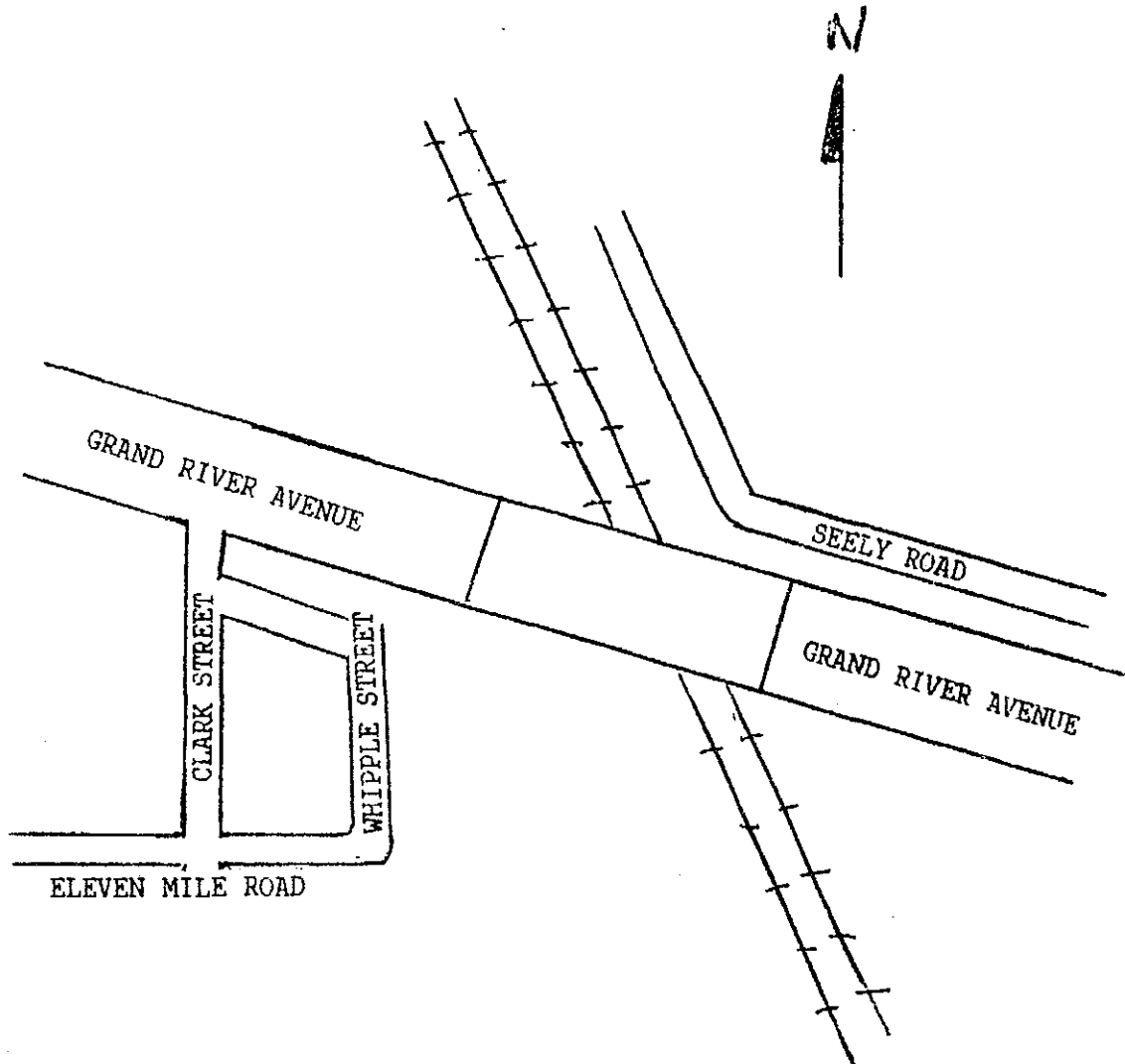
Rowena Salow, "The Story of Novi's Development," M.A. Thesis, Wayne State University, 1961.

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GENERAL SITE PLAN



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DETAILED SITE PLAN

